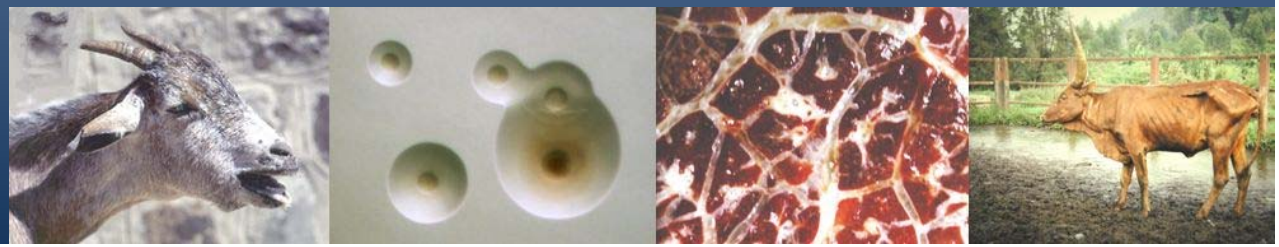
# Contagious bovine pleuropneumonia
# and
# Contagious caprine pleuropneumonia

## To vaccinate or not to vaccinate?

19th IOM meeting
Toulouse 15-20 July 2012

F. Thiaucourt* & L. Manso-Silvan
*CIRAD-UMR-CMAEE, Montpellier, France
WRL for FAO and OIE ref Laboratory

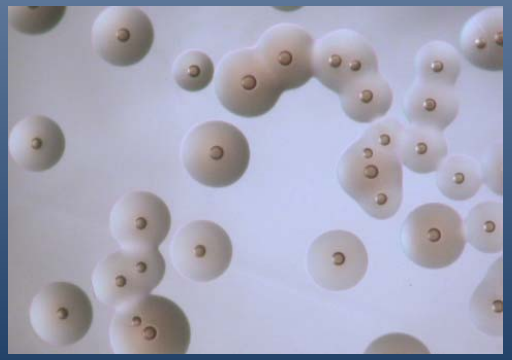
cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT



# CBPP

Bovidae

Enlargement of interlobular septa



*M. mycoides* subsp. *mycoides* « SC »

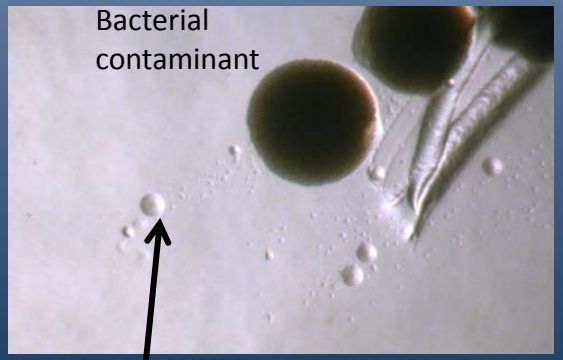
Affect ruminants

Unilateral Pleuro-pneumonia

Mycoplasma « mycoides cluster »

# CCPP

Goats and wildlife

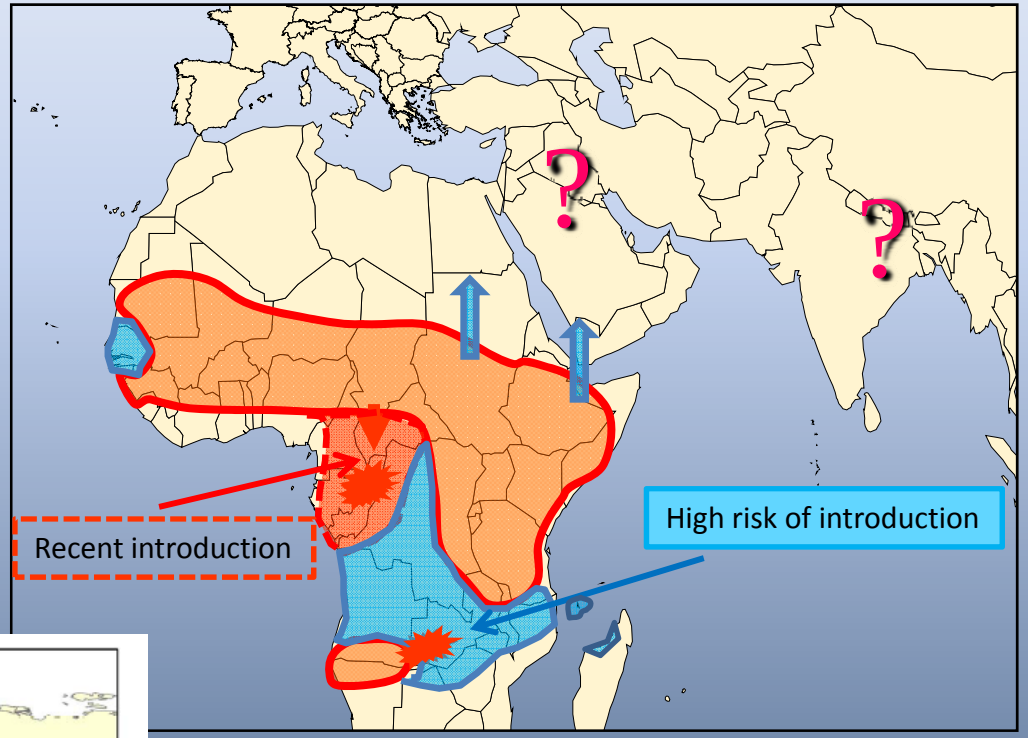


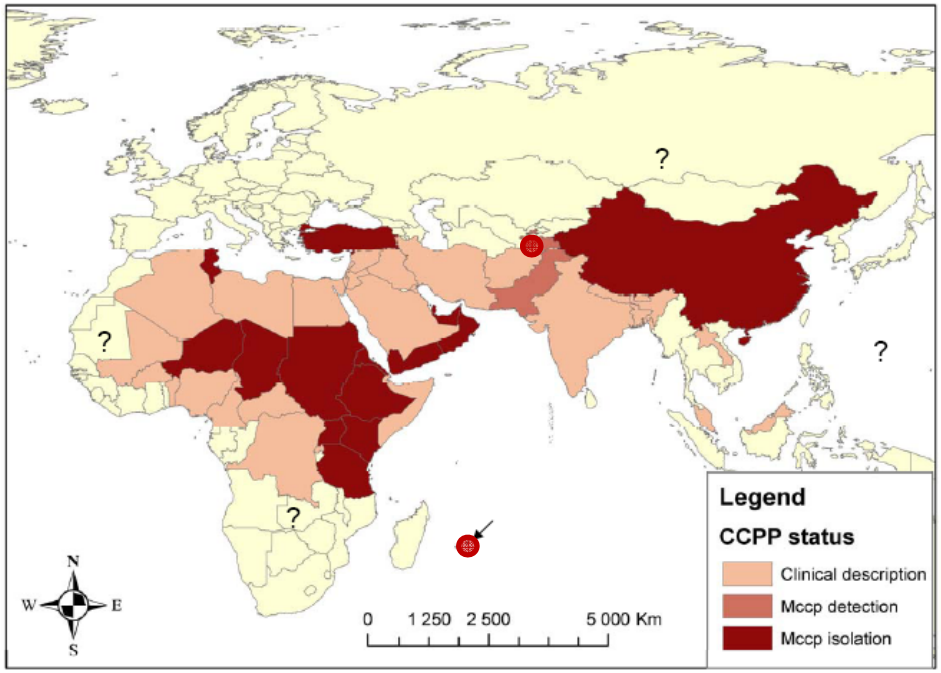

*M. capricolum* subsp. *capripneumoniae*

cirad

## **CBPP** Distribution and risk

- Sub-Saharan Africa mostly
- Recent introductions (Gabon, Congo)
- Situation in Asia not well known
- Real economical impact unknown
- Unreliable official declarations




## **CCPP** Distribution

- Extends Eastwards to China
- Real extension unknown
- Recent introduction: Mauritius
- Recent evidence: Tajikistan

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

# Steps and strategies to control/eradicate CBPP and CCPP

Evaluate distribution and economic impact

Choose a realistic objective and time-frame

Choose the best combination of technical tools
1)Slaughter-2)Vaccination-3)Movement control-4)Treatment
and spatio-temporal implementation
Evaluate socio-economic acceptance

Gain political/financial and community support

Apply the strategy

Evaluate the strategy effectiveness (cost/benefit)

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

# CBPP Epidemiology Modeling

Apparently healthy
Excretion up to 40 days
before symptoms

Mortality

Incubating

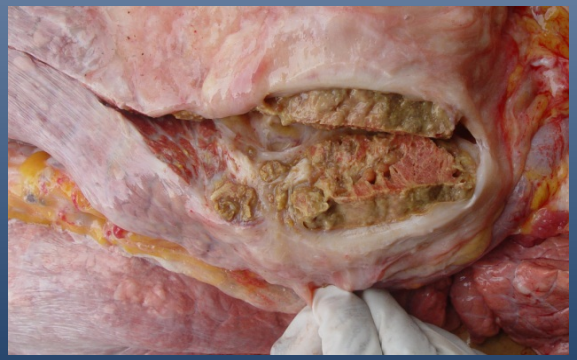
Acute disease
Infectious

Obviously sick
7-15 days

Susceptible

Chronic carriers

« Lunger » very often difficult to spot
Up to 2 years

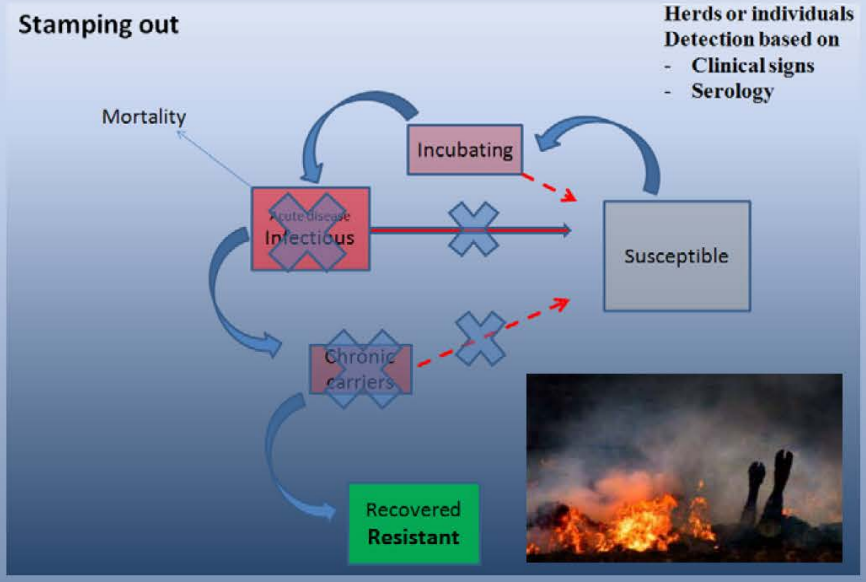


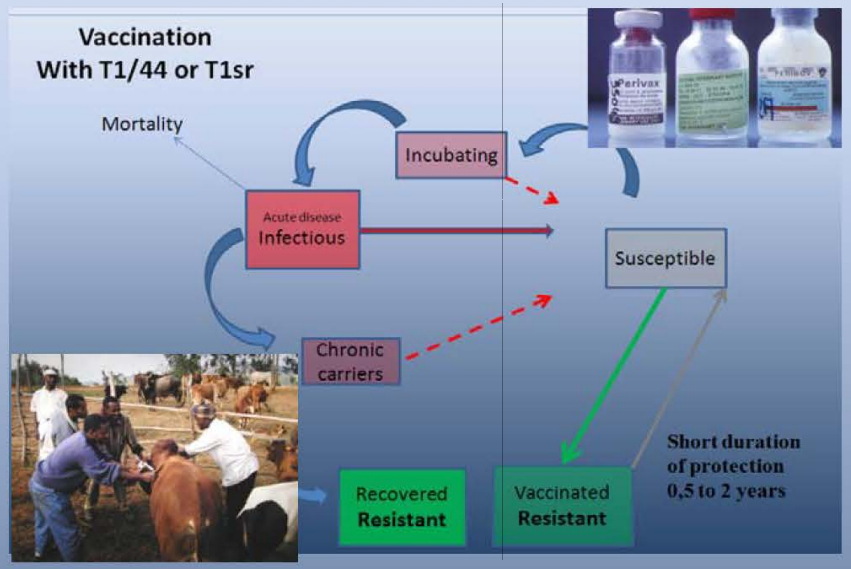
Recovered
**Resistant**

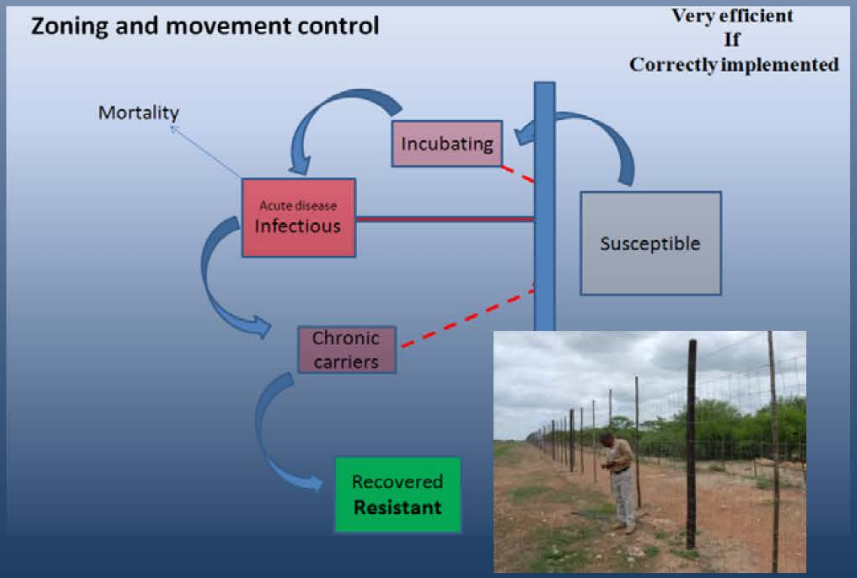
Life-long after natural infection

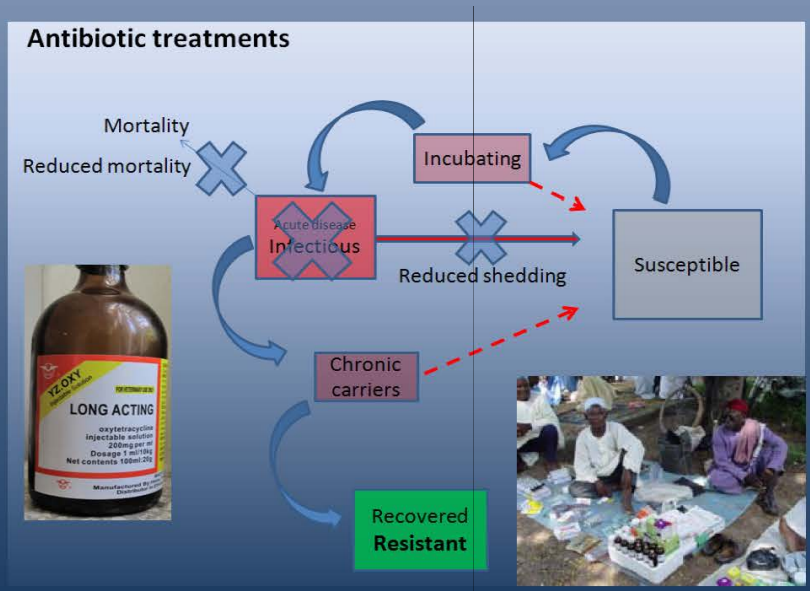
cirad

# Modeling the impact of various control tools



# Control/eradication examples In the SADC for CBPP

**Tanzania**

Vaccination alone

T1sr

**Namibia**

Zoning

Vaccination (North)

Surveillance (South)

**Botswana**

Stamping out

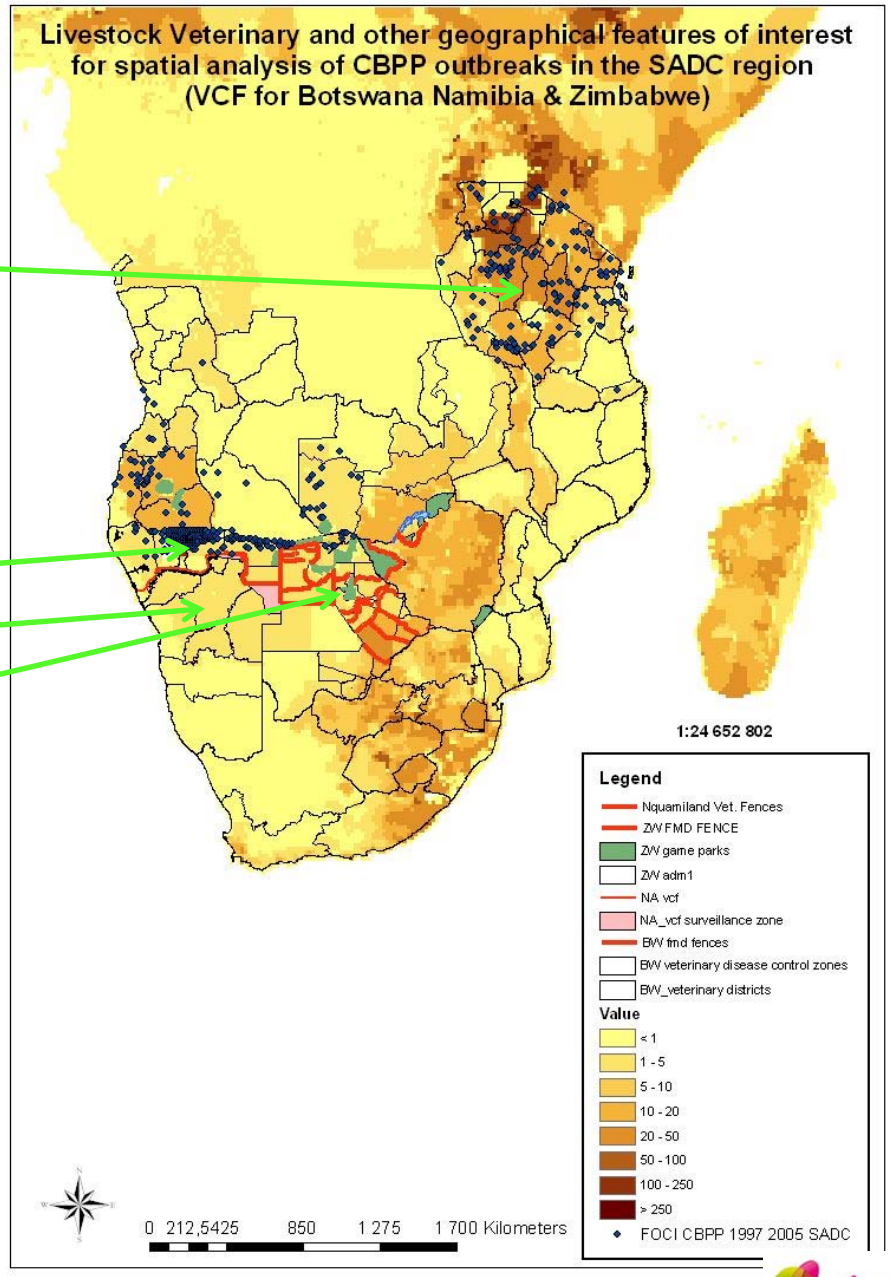
Whole susceptible

bovine population

In infected zone

Cordon fence

Limiting the infected zone



# Some critical steps in vaccine production and field implementation

Vaccine

Strain — Choice? Antigenic variability, attenuation…

Culture — Stability? Stock management

**CCPP** Purification Processing — **CBPP** Freeze Drying — Any influence on immunogenicity
Which are the protective antigens?

Quality control — CBPP: OK CCPP: not satisfactory
Identity, purity, immunogenicity, protection

Distribution — Storage — Very often « less than optimal »

Vaccination

Field activities — Very often « less than optimal »
- Vaccination of infected animals!
- Improper diluents
- Too many doses per vial (small herds)

Quality control — CBPP: no regular sero-conversion
CCPP: no serological tool

Vaccination campaign
Efficacy evaluation — Needs a reliable epidemiological network
Detection of outbreaks
Slaughterslabs surveillance …

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

# CBPP

Live, empirically attenuated strains


Advantages
Relatively low production costs
Very long conservation at -20°C once freeze-dried
Easy administration (sub-cutaneous)
T1sr: completely safe
Transient sero-conversion (allows detection of outbreaks)
Repeated vaccinations result in good protection

Drawbacks
Thermolability (freeze-dried or reconstituted)
Freeze-drying needs industrial skill
T1/44: some residual virulence
Lack of sero-conversion does not allow sero-monitoring of vaccination campaigns
A single administration does not yield good protection
Protection is short-lived (T1sr: 6 months, T1/44: one year)
Eradication cannot be achieved with vaccination alone

# CCPP

Inactivated-adjuvanted whole purified mycoplasmas

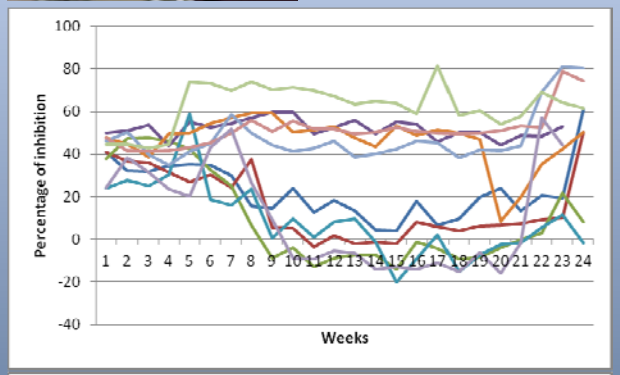
Advantages
Thermostability
Compatibility with antibiotic treatments
Inocuity (has to be checked! Depends on saponin)
Sero-conversion allowing vaccination campaign efficacy follow-up
Lower vaccination costs if multivalent vaccines available

Drawbacks
Increased production costs
Sero-conversion may hamper outbreak detection
Quality control protocols to be improved
Duration of protection not precisely established

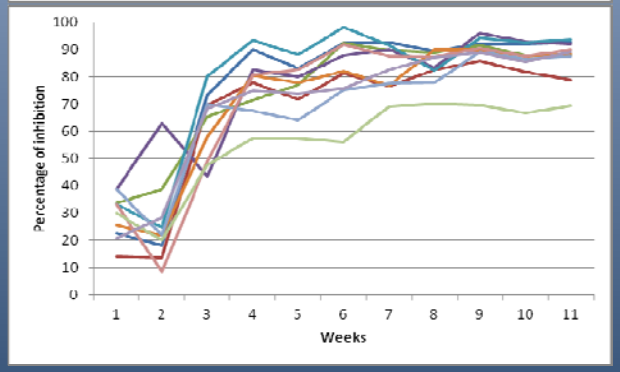
cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

# Experimental trial of an inactivated CBPP vaccine

Production of the antigen and inactivation at CIRAD
Preparation of an oil-emulsion at SEPPIC




Weak sero-conversion at KARI (Kenya) after a single shot SC
No Protection
Animals may have been immunocompromised
(CD4 T-cells are not responding to controls)




Rapid and persisting sero-conversion at LCV (Mali) after two Shots IM
Complete protection

# CBPP vaccines

There is a need for improved quality control procedure

Inadequate vaccines are available on the market

Existing control procedures do not warrant

- Antigen identity
- Immunogenic power

Shelf-life and thermostability not established

**Attenueted freeze-dried Contagious Caprine Pleuro-Pneumonia (CCPP) vaccine**

Attenueted freeze-dried Contagious Caprine Pleuro-Pneumonia (CCPP) vaccine.


**Dosage and Administration**

| | | Dose and Vaccination Schedule | |
|---|---|---|---|
| Animal | Admistration route | 1" Vaccinnation | Annual Periodic Vaccination |
| GOATS | S/C | 0,2 ml | 0,2 ml |

**Packing:** 20, 50 and 100 dose freze-drying vaccine with vaccine diluent

**Vaccine Composition:** It contains minimum 2,5 x 106 CFU BQT Mycoplasma mycoides capri strain.

**Indications:** It is for prophylactic vaccination against CCPP of goats.

KENYA VETERINARY VACCINES PRODUCTION INSTITUTE KEVEVAPI

Home | About Us | Mission Statement | Management | Products | Product Gallery | Report Dishonesty | Adverts | Gallery | Contacts

## CAPRIVAX TM

Inactivated Contagious Caprine Pleuropneumonia Vaccine

OK

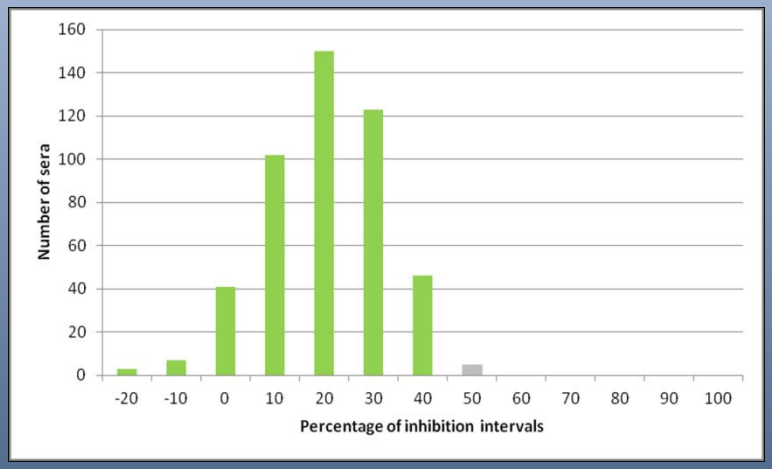
## COMPOSITION

**CAPRIVAX TM** is an inactivated Contagious Caprine Pleuropneumonia vaccine prepared from Mycoplasma capricolum subspecies capripneumoniae (Mccp), originally known as the F38 biotype. The vaccine contains lyophilised Mccp suspended in saponin.Each vaccinal dose contains a minimum of 0.15 mg of mycoplasma.

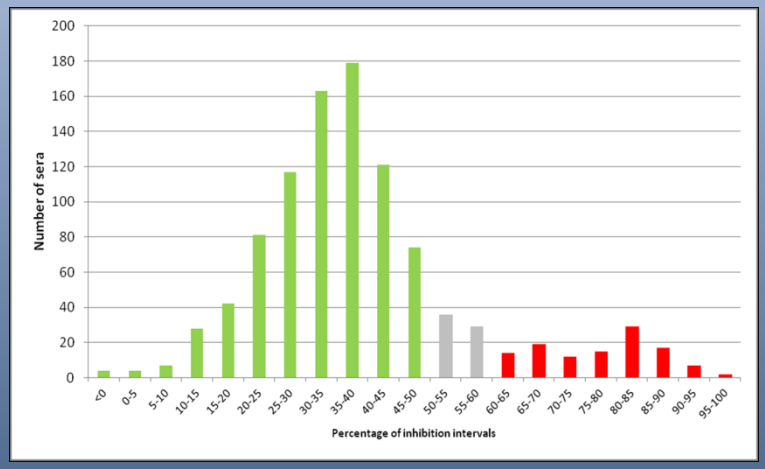
cirad


# A specific cELISA test for the evaluation of CCPP vaccine quality

Based on the use of a monoclonal antibody
Production transferred to IDEXX-Montpellier
Validation dossier accepted by the French Committee of accreditation
CIRAD accredited ISO-17025 for this test




Distribution of PI values in French goat herds
That were shown to be infected by mycoplasmas
Of the mycoides cluster but not by Mccp




Distribution of PI values in Ethiopian goat herds
In a region where CCPP is enzootic (Afar depression)

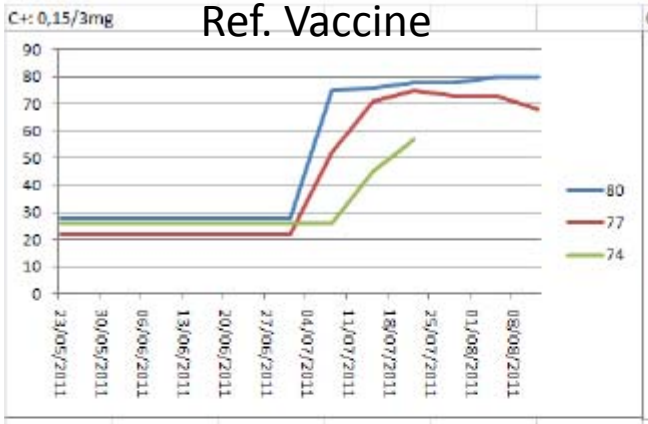
cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

## Validation of sero-conversion after CCPP vaccination with AU-PANVAC

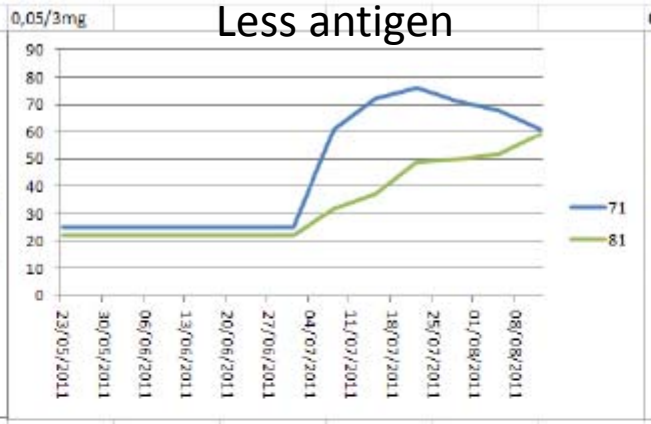
- Production of a reference CCPP vaccine batch (CIRAD)
- Vaccination of goats with various amounts of antigen and adjuvant (PANVAC)
- cELISA testing (CIRAD)

There is a correlation between sero-conversion intensity and Antigen or Adjuvant quantities which can be used to quality control CCPP vaccine batches

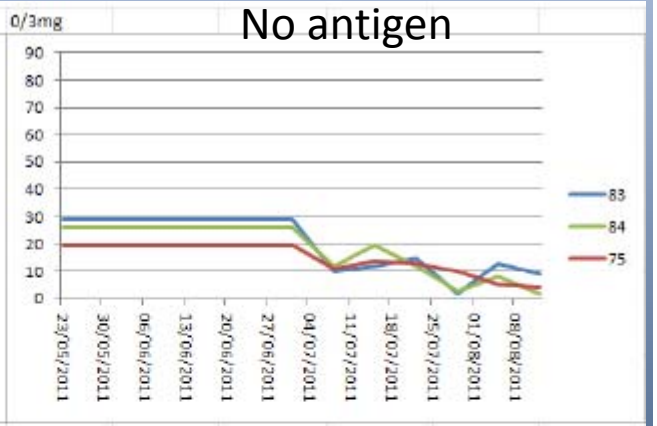
Ref. Vaccine




Less antigen

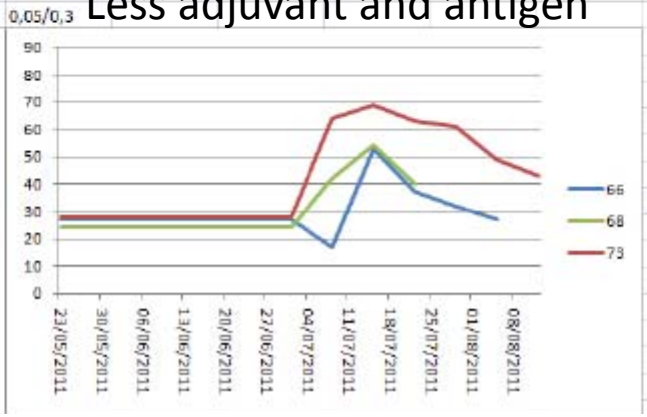



No antigen




Less adjuvant


Less adjuvant and antigen



# Conclusions and perspectives 1/2

**CBPP** and **CCPP** have been eradicated from zones, countries or continents in the past

They persist today in many countries (Africa mostly) and their distribution is expanding

Massive slaughter of infected animals or herds may not be socially acceptable any more

Prudent use of antibiotics may control these diseases, however

- Most probably, antibiotics alone will not lead to eradication
- There is a global trend to reduce the use of antibiotics (WHO, FAO, OIE) as antibioresistance is certainly the most fearful threat for human health

Antibiotics could be used in combination with vaccines in « cost-effective » strategies

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

# Conclusions and perspectives 2/2

Vaccination implementation is very often not satisfactory

- Vaccines are very often not quality controlled
- There are very few incentives for the proper implementation of vaccination
  - Lack of national funds
  - Lack of international incentives (contrarilly to FMD and PPR)

Vaccinations must be implemented within a logical framework

- Within countries, thanks to epidemiological analysis
- At a regional (trans-national) level

**Vaccines can and must be improved**

cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

Thanks for your attention

Thanks to all the colleagues that contributed to these results, within the VACNADA project or elsewhere